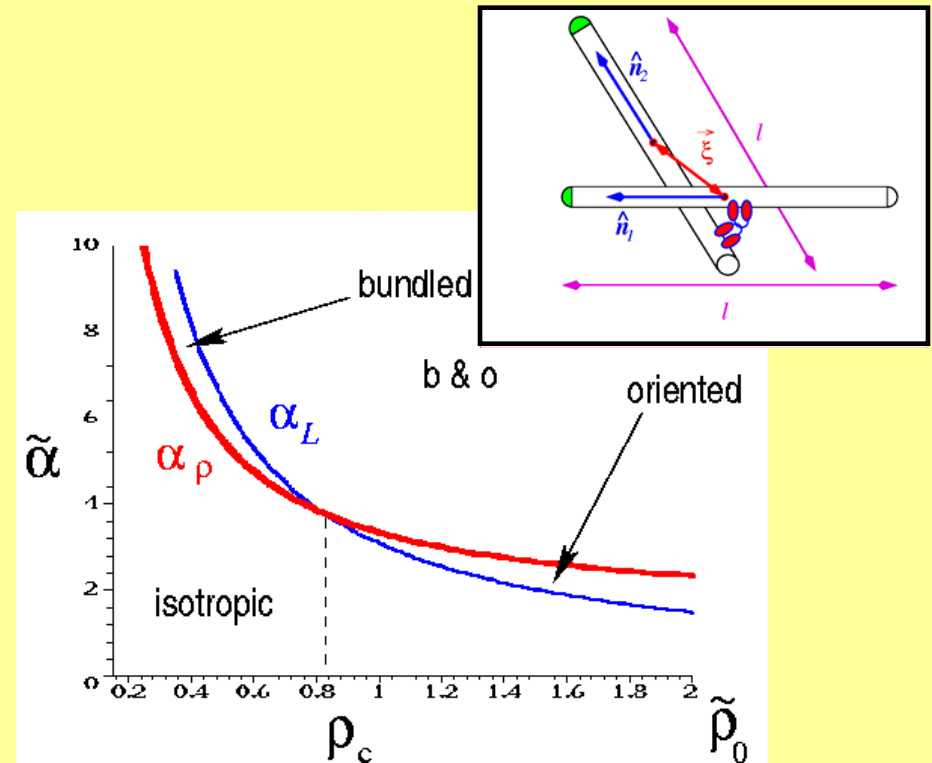


Self-organization of active solutions of polar filaments

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The cytoskeleton of living cells is a network of polar filamentary proteins cross-linked by various smaller proteins. Among these are motor proteins that induce relative displacements of the filaments, altering the mechanical properties of the network and giving rise to self-organization phenomena. We have developed continuum dynamical models of active polar solutions of filaments and motors and are using these models to study pattern formation in these systems.

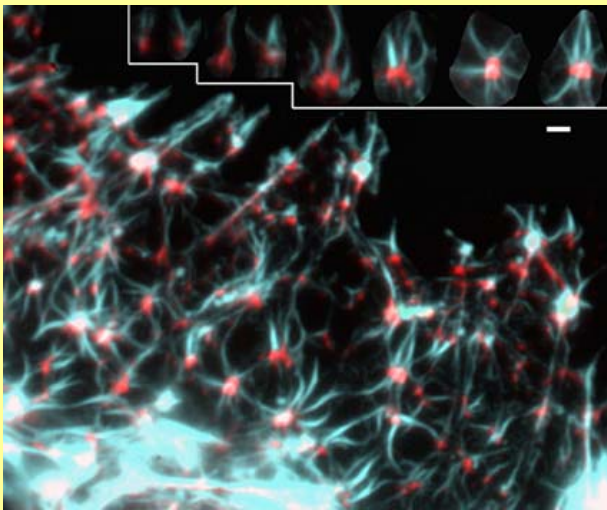
T. B. Liverpool and M. C. Marchetti,
Phys. Rev. Lett. 90, 13102 (2003).



The phase diagram shows that at high filament density ρ_0 and motor activity α , the homogeneous state is unstable to bundles or oriented structures. These may be the asters and vortices observed in *in vitro* experiments.

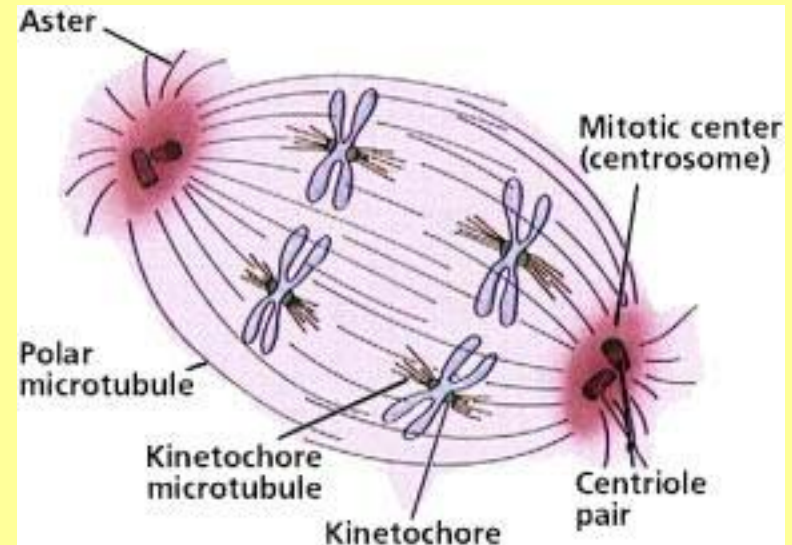
Relevance to cell biology:

- mechanical properties of the cytoskeleton
- cell locomotion
- cell division and formation of the mitotic spindle



Formation of asters in actin-myosin systems.

A. B. Verkhovsky et al., J. Cell Sci. **110**, 1693 (1997).



mitotic spindle

General theoretical issues:

- relation between mechanical properties and structure
- relation between structure and function